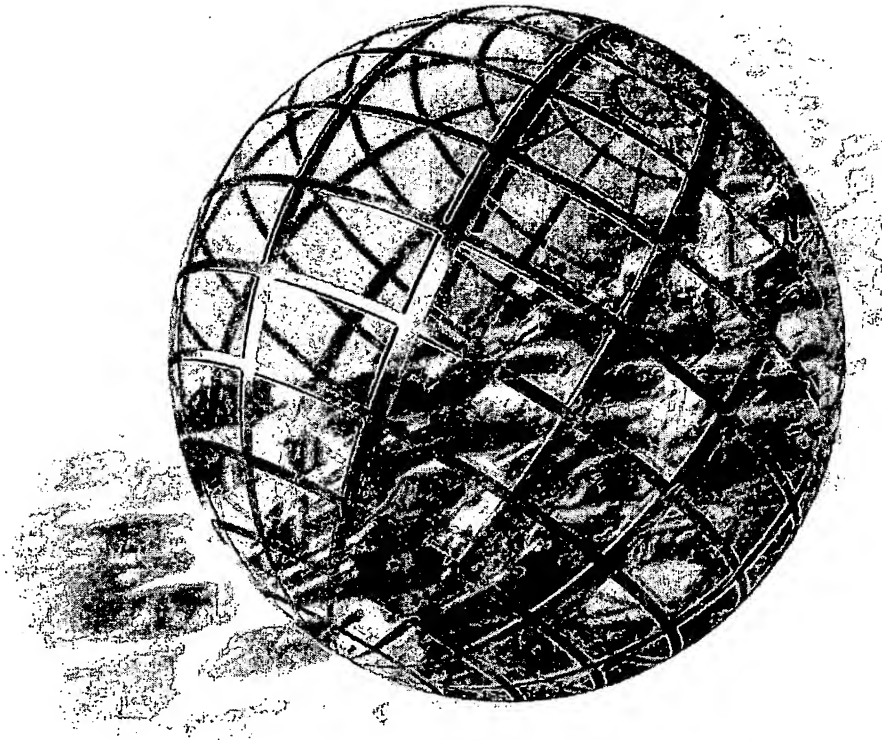


**Schenck Motorama Inc.**  
**Proposal**  
**Robotic Stemmer**  
**Quote #99347**



SUBMITTAL DATE

May 31, 2002

To:

General Motors Corp.

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**ROBOTIC STEMMER**  
**SCHENCK MOTORAMA INC. QUOTATION #99347**

Friday, May 31, 2002

ATTN:

Tony Feldhus

General Motors Corp.  
World Wide Purchasing  
1999 Centerpoint Pky  
Pontiac Mi. 48335

Subject: SMG Quotation for Robotic Stemmer

Reference: Your RFQ Dated May 3 2002 TK0026064.

Thank you, for the opportunity to provide our proposal for a Robotic TPM Stemming Machine. Please find the attached proposal highlighting key aspects of our Proposal.

The equipment proposed herein has been priced upon the basis of information received from the customer prior to the date of the proposal.

If we can be of any assistance during the evaluation phase of the project, please do not hesitate to contact Brian Hoy or myself at (248) 478-3500.

Sincerely,

Ben Giacona

1. Clarifications:

- a) TPM Sensors not included in run-off 6-04-02
- b) Repeatability of Robots needs approval 6-04-02

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# 1 INTRODUCTION

After review of the initial bid package Schenck Motorama Inc. has decided to propose three different concepts for your review.

These concepts are as follows:

- A. TPMS and Standard Stemmer With Fanuc R-2000iA Robots
- B. TPMS and Standard Stemmer With Fanuc LR Mate 200i
- C. TPMS and Standard Stemmer Non Robotic

## 2 Concepts Overview

### 2.1 Op (1) TPMS and Standard Stemmer With Fanuc R-2000iA Robots

This option utilizes GM standard size robot. (2) Robots in line with TPM tooling consists of the TPM holding device nut feeding and nutrunner mounted to the end of the robot. Inspection station and Vision systems will send the required offset to the Robot for proper stem insertion of either TPMS or STD rubber stem.

#### 2.1.1 Wheel Identification

This station will be prior to entrance of stemming station consisting of bar code or vision system, based on plant and product provisions (some product has a bare code prior to delivery to GM)

Station relays crucial information to the stemming station, such as style of stem, size and dimensional information that is required for stemming.

#### 2.1.2 Conveyor Section

Conveyor section will be approximately seven-foot in length, consistent to the Micro-Poise stemmers that are in placed at the GM facility, making modification to existing lines should be minimal,

Conveyor section will also have two lifting orient station and lighting for vision incorporated into it. Due to the cycle time required to torque the TMP NUT, two stations are required to maintain the 8.5 to 9.0 second cycle time.

### **2.1.3 Tooling TPM/STD Low Or High Pressure Stem**

TPM tooling consists of the TPM holding device, nut feeding and nutrunner. Mounted to the end of the robot.

Based on commonality of the TPM stem, tooling will not need to be changed.

The tooling design will allow ease of removal of the stem from feeder parking device. This simplifies the delivery system of the TPM and standard stem (low or high pressure).

### **2.1.4 Feeders TPM / Nut / & STD Stem (Low Or High Pressure)**

Each station should have it's own feeder for each product being used. The nut feeder will blow the nut directly to the feeding system on the end of the robot while the standard stem feeder will have a simple parking station that allows the robots end tooling to remove it easily.

### **2.1.5 Vision System**

Each stemming station will consist of singular ARKK vision systems mounted directly above the lift station to relay information for the positioning of the robots end tooling.

## **2.2 Op (2) TPMS and Standard Stemmer With Fanuc R-2000iA Robots**

This option utilizes a Common base with (2) Fanuc R-2000iA mounted on the same side with a dual station configuration. TPM tooling consists of the TPM holding device nut feeding and nutrunner mounted and located within robot reach at separate stations. Standard Rubber stem guns will be mounted on opposite side to robots, also in a dual station configuration.

Inspection station and Vision systems will send the required offset to the Robot for proper stem insertion of either TPMS or STD rubber stem.

### **2.2.1 Wheel Identification**

This station will be prior to entrance of stemming station consisting of bar code or vision system, based on plant and product provisions (some product has a bare code prior to delivery to GM)

Station relays crucial information to the stemming station, such as style of stem, size and dimensional information that is required for stemming.

### **2.2.2 Conveyor Section**

Conveyor section will be approximately seven-foot in length, consistent to the Micro-Poise stemmers that are in placed at the GM facility, making modification to existing lines should be minimal,

Conveyor section will also have two lifting orient station and lighting for vision incorporated into it. Due to the cycle time required to torque the TMP NUT, two stations are required to maintain the 8.5 to 9.0 second cycle time

### **2.2.3 Tooling TPM/STD Low Or High Pressure Stem**

TPM tooling consists of a simple holding devise that will hold the TPM, mounted to the end of the robot.

Based on commonality of the TPM stem, tooling will not need to be changed.

The tooling design will allow ease of removal of the stem from feeder parking device. This simplifies the delivery system of the TPM.

Nutrunner and nut feeding assembly will be mounted above to a Fanuc or Kuka series robot) making it possible to apply a nut to either side of station

Tooling for low or high-pressure stem will consist of a standard SMG stemming unit.

### **2.2.4 Feeders TPM / Nut / & STD Stem (Low Or High Pressure)**

Each station should have it's own feeder for each product being used. The nut and standard stem (low or high pressure) feeder will blow the nut/ stem directly to the feeding system on either the end tooling of the robot or the standard SMG stemming unit. The TPM stem feeder will have a simple parking station that allows the robot end tooling to remove it easily.

### **2.2.5 Vision System**

Each stemming station will consist of singular ARKK vision systems mounted directly above the lift station to relay information for the positioning of the robots end tooling.



## **2.3 Op (3) TPMS Schenck Motorama Inc. Standard Stemmer Non-Robotic**

This option utilizes standard components to achieve stemming of either TPM or Standard Rubber stems without utilizing and robots.

### **2.3.1 Sequence of operation**

Two wheels stop at the raised on-deck stops of the Wheel Stemmer, where the wheel diameter is determined by a series of photo eyes. This information is used to determine the raised position of the in-station stops (Wheel Data is pre-programmed to the stemmer and utilized for gun positioning and wheel positioning once wheel ID is obtained). The on-deck stops lower and the wheels enter the TPM Wheel Stemmer by powered rollers and then transfers to the conveyor chains.

When the wheel clears the photo eye, the on-deck stops raise, holding the next incoming wheels as the current wheels transfers to the soaping position. The conveyor chains continue to run for a small period of time to allow the wheel to travel to the in-station stops. The conveyor chains stop.

### **2.3.2 Rubber Stem Insertion**

When the in-station-centering device positions the wheel, the wheel lifts raises the wheel and the multi-chuck expands securing the wheel to a pre-programmed height.

Once the wheels are centered and positioned the right standard rubber guns advance. The optic photo eyes, which are mounted directly on the guns, locate the stem hole. Once in position the gun inserts the stem in the wheel.

After insertion of the stem, the guns retract. The wheel lift lowers the wheel onto the conveyor chains. The conveyor chains start. The in-station stops raise, while the on-deck stops lower.

### 2.3.3 TPM Insertion

When the in-station-centering device positions the wheel, the wheel lifts raises the wheel and the multi-chuck expands securing the wheel to a pre-programmed height.

The optic photo eyes, which are mounted in the station, locate the stem hole. Once in position the mechanical gripper assembly inserts the TPM in the wheel. The nut runners located above the wheel assembly properly fasten and torque the fasteners.

After insertion of the TPM and fasteners retracts. The wheel lift lowers the wheel onto the conveyor chains. The conveyor chains start. The in-station stops raise, while the on-deck stops lower.

### 2.3.4 Wheel Identification

This station will be prior to entrance of stemming station consisting of bar code or vision system, based on plant and product provisions (some product has a bare code prior to delivery to GM)

The lighting for vision will be incorporated into this station

This information is sent to the stemmer for wheel positioning.

Station relays crucial information to the stemming station, such as style of stem, size and dimensional information that is required for stemming.

### 2.3.5 Conveyor Section

Conveyor section will be approximately seven-foot in length, consistent to the Micro-Poise stemmers that are in placed at the GM facility, making modification to existing lines should be minimal,

The Machine base with integrated conveyor section will have two lifting orient stations. Due to the cycle time required to torque the TMP NUT, two stations are required to maintain the 8.5 to 9.0 second cycle time

### **2.3.6 Tooling TPM/STD Low Or High Pressure Stem**

TPM tooling consists of a simple holding devise that will hold the TPM, mounted to the end of the fixture mounted on the base.

Based on commonality of the TPM stem, tooling will not need to be changed.

Tooling for low or high-pressure stem will consist of a standard SMG stemming unit.

### **2.3.7 Feeders TPM / Nut / & STD Stem (Low Or High Pressure)**

Each station should have it's own feeder for each product being used. The nut and standard stem (low or high-pressure) feeder will blow the nut/ stem directly to the feeding system on the end tooling of the standard SMG stemming unit. The TPM stem feeder will have a simple feed mechanism to feed the stems to the gripper Assembly.

### **2.3.8 Vision System**

Vision system is not required with this configuration.

<sup>1</sup>Note: All stems rubber and TPM provided by customer.

## **2.4 Electrical Controls**

### **2.4.1 General Controls Design**

SMG will provide an NEMA 12 enclosure sized to house the PLC, and control devices including disconnects, relays, circuit breakers, terminal strips, power supplies, and controllers. Consistent with existing equipment at your facility, the nut runner control will be incorporated in the main NEMA 12 enclosure with all required electrical control devices. All necessary, junction boxes and wire way will also be provided between the machine and control panel. The operator console will be housed in separate enclosures.

## **2.5 Electrical General**

Schenck Motorama Inc. will provide architecture per Gm specifications

## 2.5.1 PLC System

PLC will monitor safety conditions and provide functionality of the overall stemmer including various operator-controlled clamps, actuators, and etc. Furthermore, ladder logic program will communicate with the test controller to indicate faults and messages on the controller screen. This PLC will be housed in our control panel.

- Logixs 5550 Processor
- I/O Rack
- Allen Bradley Flex I/O
- Devicenet communications

## 2.5.2 HMI

A Panel view with enclosure will be provided for machine functionality, status, and monitoring.

- PV 1000 Color Touch Screen.
- PV Enclosure with Pushbuttons and Switches per specifications by GM.

## 2.6 Noise Immunity

SMG will institute proper EMI shielding and grounding techniques to ensure that radiated and conducted noise are not induced on the signal. SMG will seek the approval of GM for the techniques applied during the design, construction, and acceptance test phases.

Strict attention will be paid to signal isolation and separate conduit / wire way will be utilized to minimize unnecessary electrical noise in the system.

Components in the electrical panel will be arranged such that the parallel runs of different levels of wiring are minimized.

All signal and control wires will be 100% shielded with no open terminals and no greater than 1" peel back of wire cables.

Terminations or breaks in the wire will be reduced to a minimum.

All grounds will be individually carried through the terminal strips.

### **3 DOCUMENTATION**

Manuals and documentation will be provided per GM specification.

#### **3.1 Manuals**

Three (5) sets of updated machine operation manuals.

#### **3.2 Commercial components documentation**

One (1) complete set of vendor/commercial component documentation and application instructions.

#### **3.3 Drawings set**

Per GM specification.

One (1) complete set of electrical, and pneumatic, design drawings and BOM will be provided on CD.

One (1) complete set of electrical, pneumatic, and hydraulic design drawings and BOM will be provided on 11x17 printout.

#### **3.4 Computer system documentation**

One (1) complete set of computer software, hardware documentation package as provided by Schenck Motorama Inc..

#### **3.5 Drawing tool**

All designs will be produced on AutoCAD 14, 2000 or <sup>2</sup>Uni-graphics per GM specifications.

#### **3.6 Project Schedules**

SMG will submit build schedule/progress reports to GM as required by GM. These reports will be created using "Microsoft Project" or equivalent.

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<sup>2</sup> Clarification of drawing tool. Pricing is per GM specification and UG GM to own design per spec.

### 3.7 External Cables

External cable 50 feet long are provided with the systems. The cables included are:

- All cables between the panel and the Machine.
- All cables between the panel and field devices.
- All cables between the panel and the HMI.

### 3.8 Installation Supervision

Service personnel who are familiar with all aspects of the machines will be provided during the installation of the equipment and the final run-off in the customer's plant.

**(7) Days of on site installation supervision are included (1) Man (10 Hours/day continuously.**

Specific support engineers will be on site for mechanical and control installation of the equipment. This equipment will remain as their priority until the final acceptance is completed.

Note: The installation/start-up supervision period provided above only covers the amount of days stated. If additional installation/start-up supervision is required due to customer's circumstances other than SMG equipment, etc. not being ready), it will be the responsibility of the customer to compensate Schenck Motorama for any additional time and expenses incurred in addition to the specific period stated above.

### 3.9 Production Supervision

Service personnel who are familiar with all aspects of the machines will be provided during the installation of the equipment and the final run-off in the customer's plant.

**(14) Days of on site installation supervision are included (1) Man (10 Hours/day continuously.**

Specific support engineers will be on site for mechanical and control installation of the equipment. This equipment will remain as their priority until the final acceptance is completed.

Note: The installation/start-up supervision period provided above only covers the amount of days stated. If additional installation/start-up supervision is required due to customer's circumstances other than SMG equipment, etc. not being ready), it will be the responsibility of the customer to compensate Schenck Motorama for any additional time and expenses incurred in addition to the specific period stated above.

### 3.10 GM Responsibilities

In order to insure efficient and correct installation of the equipment the following will be provided by GM.

- All required facilities connection to the equipment. All connections will be identified during the design phase of the project.
- Production floor preparation.
- Building clearance for rigging hardware (bay door openings, production area floor clearance).
- Placement of the test system on Customers Floor.
- Required skill trades personnel to complete all necessary inter connections.

### 3.11 Training

SMG welcomes the participation of GM Production, Maintenance and Engineering Departments during the build and de-bug phase of this project. From our recent experience, this is some of the most valuable time available from training and, input relative to ways to make the machine meet all users needs.

### 3.12 Formal Training

#### Operator Level

- 2 day session - operation/fault observation
- 7 hour day
- Optimum classes size 4-5 max. 8

#### Maintenance Level Electrical (excluding drives & Computer software)

- 1 day sessions - theory of operation, operation & troubleshooting
- 7 hour day
- Optimum classes size 3-4 max. 6

#### Maintenance Level Mechanical/Hydraulic/Pneumatic

- 1 day sessions - theory of operation, operation & troubleshooting
- 7 hour day
- Optimum classes size 3-4 max. 6

#### Vision System

- 1 day sessions - theory of operation, operation & troubleshooting
- 7 hour day
- Optimum classes size 3-4 max. 6

### 3.13 Sub-Suppliers Training (Optional)

SMG will provide the basic equipment training. Sub-suppliers (Drive, PLC, and Nutrunners) can supply specific product training (Not included in the SMG proposal). SMG would be glad to coordinate all efforts.

### 3.14 Project Management

An SMG project manager will be responsible for scheduling and coordinating the project for the above equipment. The project manager will define the projects quantifiable goals and specifications with the customer. All scheduling will be provided in chart forms (per SMG standards), which will be provided to the customer. Transportation, lodging and per diem expenses are included. In addition, SMG will manage all aspects of Bauer controls participation in this project.



## 4 Price Summary

Please Reference GM Price Sheets Attached

## 5 Terms and Conditions

### 5.1 Delivery

SMG will design, build and deliver the system in 28-30 weeks ARO.

### 5.2 Shipment

The delivery is based on the receipt of the official purchase order number and all engineering information. Delivery subject to change upon receipt of order, if order is received after 30 days from date of this quotation. Shipping terms are FOB Schenck Motorama Inc., Farmington, Mi. SMG will coordinate shipment with your traffic office.

### 5.3 Terms and Payment

The following schedule lists the milestones and percentage of the total equipment cost to be invoiced after completing the work.

Due upon Shipping from Schenck Motorama Inc.	90%
Final acceptance at buyer's floor but no later than 90 days from completion of installation. (Payment delays beyond 90 days will bear interest @ 1-1/2% per month).	10%

This proposal is subject to Schenck Motorama, Inc. Standard Terms and Conditions of Sale, Form: SMG-BU-F-009, REVISION: 08 Feb 02, Contained herein, unless otherwise specified.

If not withdrawn by notice in writing prior to the expiration thereof, this offer shall remain open for a period of sixty (60) days after receipt of proposal by the customer and conformation by letter, fax or e mail reply back to Schenck Motorama Inc.

This offer cannot be changed or modified verbally.

#### **5.4 Additions/Alterations**

Extra work will be performed after receipt of written authorization. Fees for additions or alterations will be submitted in writing and added to customer's invoice. Additions and/or alterations may effect the delivery date.

#### **5.5 Payment Method**

All prices of this quotation are in United States Dollars and are exclusive of any domestic or international taxes or duties. Taxes and duties would be extra, where and if applicable.

#### **5.6 Warranty**

Schenck Motorama Inc. warrants that the material and equipment provided will be free from defects in material and workmanship under normal use for a period of twenty (24) months after acceptance by primary buyer, or three (3) months after shipment (whichever comes first). All components or sub-systems manufactured by other than SMG will be subject to the warranty terms and conditions of the component or subsystem manufacturer.

#### **5.7 Validity**

This proposal and pricing are valid for a period of 60 days